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Life history of *Stenopsyche siamensis* MARTYNOV 1931 (Trichoptera: Stenopsychidae) from Doi Chiang Dao catchment area, Chiang Mai Province, Thailand

Pongsak LAUDEE & Porntip CHANTARAMONGKOL

Abstract: The life history and larval feeding biology of *Stenopsyche siamensis* SCHMID 1969 were studied in Mae Na stream, Doi Chiang Dao catchment area, northern Thailand. The adults and pupae occurred in all seasons. Adults of *Stenopsyche siamensis* showed a non-seasonal flight period pattern. Frequency analysis of the larval head capsule width revealed the presence of five instars. The insect exhibited non-seasonal univoltine life cycle. The larvae are filter-feeders that consume detritus, benthic diatoms and green algae.

Introduction.

The family Stenopsychidae is divided into three genera: *Stenopsychodes* (nine species) from Australia, *Pseudostenopsyche* (two species) from Chile, and *Stenopsyche* (about 78 species) found mainly in the Oriental and southeastern Palearctic (DUDGEON, 1999). Stenopsychid larvae are a distinctive element in the fauna of streams in Asia. MALICKY and CHANTARAMONGKOL (1999) reported six species of stenopsychid in Thailand. From their research, *Stenopsyche siamensis* is known to occur in all parts, i.e. northern, northeast, southern and western Thailand. In Asia, the life cycles of stenopsychids have been reported from Japan and Hong Kong. There are five larval stages of the Hong Kong stenopsychid, *Stenopsyche angustata* (DUDGEON, 1996). In Peninsular Malaysia, adults, pupae and larvae of *Stenopsyche siamensis* were fully described and compared with other species from Asia (ISMAIL *et al.*, 1996). In the present study, the life cycle pattern, development time and larval feeding biology were studied.

Material and Methods.

The life history and larval feeding biology of *Stenopsyche siamensis* MARTYNOV 1931 were studied in Mae Na stream, Doi Chiang Dao catchment area, northern Thailand. (19°19'N-19°20'N, 98°55'E-98°56'E). Larvae of *Stenopsyche siamensis* were collected in monthly hand picking from the stream site during March 1999–February 2000. The head capsule widths were measured with an ocular micrometer. The distribution of head capsule widths was plotted to determine the larval instars of the insect. To determine the development time first instar larvae were collected and cultured in the site in an enclosure. The head capsule widths of the larvae were observed every week until they reached the fourth instar. To complete the study of the life cycle, the forth instars were reared in a 20-22°C temperature-controlled incubator in the laboratory to determine the development time of the fifth instars, pupation and adult life.

To study the feeding behavior of this insect, larvae were collected from the study sites. The heads were pulled off by forceps. Each fore gut, which should remain intact and attached to the head, was dissected and examined under a compound microscope. The food in each gut was identified and photographs taken.

Results

The results of seasonal light trap collecting (hot season-March, 2000; rainy season-July, 2000; cool season-October, 2000) showed that adults of *S. siamensis* were found all seasons; they peaked in the hot season, and decreased in the cool season.

In monthly samples, a total of 431 stenopsychid larvae were gathered. The head capsule widths were discontinuously distributed from 0.300-1.450 mm. Monthly distribution ratios of each instar are shown in figure 2. Frequency analysis of the larval head capsule widths revealed the presence of five instars. The ranges and mean \pm SD of head capsule width of each instar were:

Instar I: HCW = 0.300-0.325 mm, 0.306 \pm 0.012 mm (n=4)

Instar II: HCW = 0.375-0.450 mm, 0.412 \pm 0.018 mm (n=16)

Instar III: HCW = 0.600-0.725 mm, 0.664 \pm 0.032 mm (n=79)

Instar IV: HCW = 0.950-1.100 mm, 1.009 \pm 0.033 mm (n=140)

Instar V: HCW = 1.200-1.450 mm, 1.327 \pm 0.057 mm (n=192)

The size distribution of head capsule widths showed an increasing pattern in a regular geometric progression of a factor of 1.48.

Larval rearing experiments at the study sites and in the laboratory showed a development time of 2 weeks in instar I, 3 weeks in instar II, 3-5 weeks in instar III, 7-8 weeks in instar IV, and 22 - 26 weeks in instar V. The time for pupation was 4-5 weeks and the adults of *S. siamensis* lived for only 1-2 weeks after emerging.

Gut content analysis of 2nd-5th larval instars of *Stenopsyche siamensis* was performed on larvae collected in September 2001. The predominant items eaten by larvae were fine particulate organic mater (FPOM), benthic diatoms, green algae, and protozoa. These results show FPOM and benthic diatoms were the major dietary items and green algae and protozoa were minor dietary items. The diet of the second, third, fourth-instar larvae examined showed no difference from that of the final-instar larvae. The results of gut analysis showed the larvae are filter feeders.

Discussion.

Stenopsyche siamensis from the Doi Chiang Dao catchment area exhibited a non-seasonal univoltine life cycle, which is similar to that of the Hong Kong stenopsychid, *Stenopsyche angustata* (DUDGEON, 1996). In Japan, GOSE (1970) reported that

Stenopsyche griseipennis which lives in cooler streams or in up-stream situations, has a univoltine life cycle in contrast to those that live in warm streams or down-stream, which have a bivoltine life cycle. However, WILLIAMS *et al.*, (1995) has concluded that the life history plasticity of many aquatic insects results from extrinsic factors such as stream temperature.

The gut content analysis showed that the stenopsychid larvae consume fine particulate organic matter and benthic algae predominately the diatom, *Aulacosira granulata*. NISHIMURA (1966) and ISMAIL *et al.* (1996) reported that stenopsychid larvae feed on detritus (mainly) and algae (predominately diatoms).

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Correspondence:

P.L., Department of Science and Technology, Community College, Prince of Songkla University, Surat Thani Campus, Surat Thani, 84100 Thailand.
P.C., Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200 Thailand

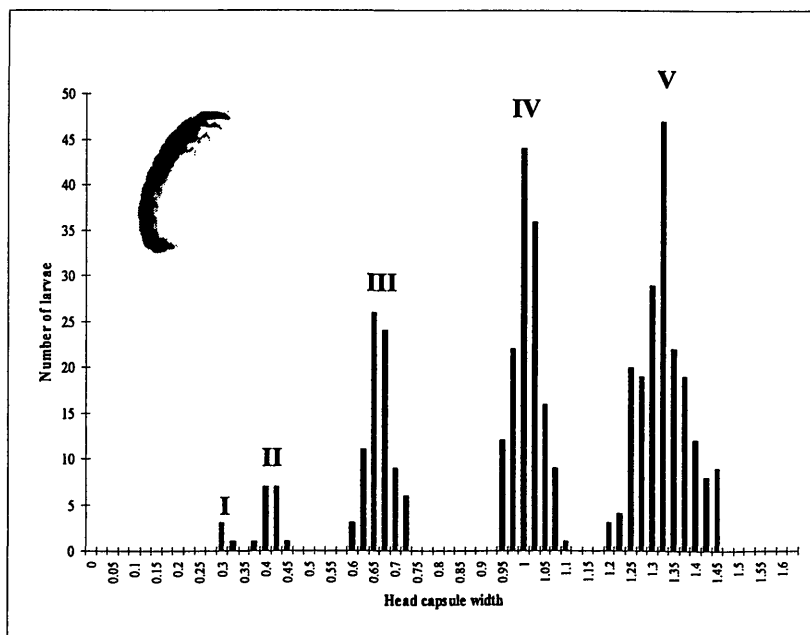


Figure 1. Distribution of head capsule width (mm) of larvae of *Stenopsyche siamensis*.

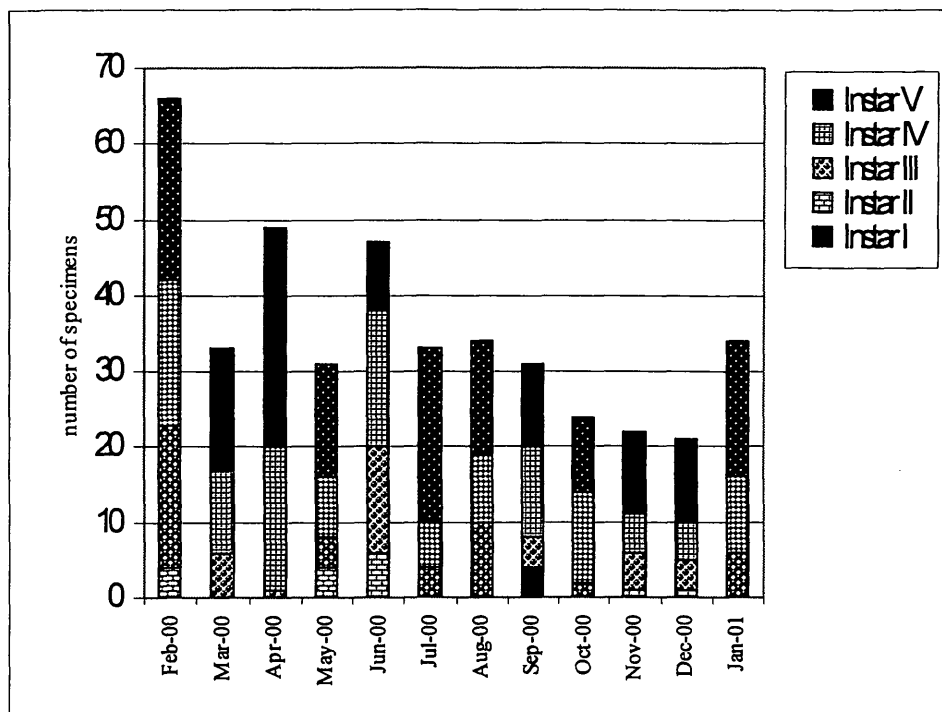


Figure 2. Monthly distribution ratio of each instar of *Stenopsyche siamensis*



Change of address:

Mathias Hohmann
Silberstraße 17
D – 39261 Zerbst
HohmannMathias@aol.com

Kari-Matti Vuori
Dept. of Biological &
Environmental Science
University of Jyväskylä
P.O.Box 35 (YA)
SF – 40014 Jyväskylä

Andrew P. Nimmo
Biological Sciences Dept.
CW 405 Bio. Sci. Bldg.
University of Alberta
Edmonton, Alta. T6G 2E1
Canada
g.ball@ualberta.ca

Dr. Ákos Uherkovich,
Dr. Sára Nógrádi,
Építők útja 3/b. I. 6.
H – 7633 Pécs
uhu@ipisun.ptt.hu



List of research workers on Trichoptera

Julieta Valeria Sganga, Student. Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Dto. Cs. Biológicas, Lab. Entomología, Pab. II, Ciudad Universitaria, C 1428 EHA. Buenos Aires, Argentina.

Present interest: Hydropsychidae, esp. *Smicridea*; Systematics, morphology, ecology. Previously studied: Adults and larvae of Trichoptera from Argentina. Investigation area: Neotropical Region. Willing to identify Trichoptera material for other workers. Material wanted: Neotropical Trichoptera, especially Hydropsychidae. Other interests: Biospeleology, Evolution.

Walter R. Bravo, Biologist. Fac. Ciencias Exactas y Naturales, Department of Biology, Laboratory of Entomology. Universidad de Buenos Aires, C 1428 EHA, Buenos Aires, Argentina.

Present interest: Hydrobiosidae, systematics and morphology. Previously studied: Hydrobiosidae. Investigation areas: Argentina and Chile. Willing to identify Trichoptera material for other workers. Information wanted: Referred to Hydrobiosidae or to Trichoptera of the North of Argentina. Other interests: Aquatic insects.